

before us to satisfy us of the importance of these discoveries. They point to the economic value of totemism, in which Dr Frazer has suggested its origin is to be found. The dugong-clan on Mabuig seem to have performed rites to secure plenty of dugongs, the turtle-men to secure plenty of turtles. The office of rain-maker is said to be hereditary in a certain family, though to what clan it belonged and what position it occupied in the clan we are not yet told. The localisation of the totemic ceremonies, the use of the same word (*aug'id*) to mean the totem itself, the sacred objects used in the ceremonies, and a human ancestral (though probably mythical) hero suggest that totemism was passing into the worship of ancestors, or at least into hero-worship, "and a hero-worship that is suspiciously like the origin of a god." Not less important than the meaning and development of totemism is the delimitation of its area. Here, too, good work has been done. Although totemism was flourishing in the western islands of the Straits and bore evidence that it had been brought with the immigration from New Guinea, the travellers failed to trace it in some of the powerful stocks of British New Guinea; they ascertained that there was no true totemism in the eastern islands, and their researches in Borneo seem definitely to negate any connection between the animal-cult of the tribes in Sarawak and totemism.

Where the totem-clan does not exist, a point of great interest is the organisation of society and the conception of relationships. On this we are told nothing directly. We learn, however, that Dr. Rivers made minute inquiries into the genealogy of the Murray Islanders and some other peoples. It is to be hoped that when these are published we shall have some data for inferences, not merely as to hereditary qualities, but also as to social relations.

Interesting as the chapters relating to Torres Straits and New Guinea are, those which narrate the author's experiences in Borneo and discuss some of the superstitions practised there are in no way inferior. Balan's love-story is delightful, and the chapter on the peace-making at Baram forms an artistic conclusion to the mission. On the omen-animals Dr. Haddon is able to contribute some additional facts to our knowledge, as well as to describe the ceremonies he witnessed. The chapter on the cult of skulls, and the scenes in which he was an actor as the purchaser of skulls, are perhaps even more suggestive. We learn that the practice of taking skulls is not an ancient one among the Kayans and Kenyahs, two of the larger and more influential tribes. We are told that "some tribes believe that the persons whose heads they take will become their slaves in the next world," and that the vendetta is a common reason for the hunt of heads. But Dr. Haddon expresses no opinion on the origin and real meaning of the custom. Mr. Kruyt, a Dutch *savant*, has recently published an account of it as practised by the Toradja of Central Celebes. In that neighbouring island it would seem that the tribe referred to recognise a three-fold soul in every living being. There is, first, the breath; secondly, the personal soul; and lastly, a part of the universal soul or vital ether. It is the last which is attached to the skull and the scalp of man and other animals. To procure the skull, therefore, is to render oneself the possessor of the

victim's share of the vital ether. By depositing it in the shrine of the ancestral gods, this share is offered to them. As the gods appear to be the manes of ancestors, the possession of this share of the vital ether fortifies the vital ether of the family or the clan; in other words, their portion of the universal soul is augmented. Mr. Kruyt, after examining the beliefs and customs of the Dayaks and Battaks, comes to the conclusion that their head-hunting is based upon substantially the same belief. We shall be glad to know whether Dr. Haddon has observed any facts which corroborate this theory.

The volume is adorned with numerous reproductions of photographs by the author and his colleagues, as well as by many sketches. The photographs are for the most part good, some excellent. In many cases, however, the reproduction is on too small a scale for proper exhibition of the details.

Full of interest for the general public, the volume is admirably calculated to awaken scientific curiosity and bespeak attention for the detailed results of the expedition, now in course of publication by the University Press.

E. SIDNEY HARTLAND.

THE SEA-COAST OF ENGLAND.

The Sea-coast: (1) *Destruction*, (2) *Littoral Drift*, (3) *Protection*. By W. H. Wheeler, M.Inst.C.E. Pp. xii + 361. (London: Longmans, Green and Co., 1902.) Price 10s. 6d. net.

THE sea-coast is always a fascinating object to the hydraulic engineer, for besides the varieties of its conditions, it is the place where the most vehement attacks of the orcs of nature have to be encountered and provided against. The sea is an ever-present foe, the power of which when lashed into waves by gales is almost incalculable, always quick to pierce any weak point in the defences and to push forward its advantage by enlarging the breach, and sometimes producing widespread ruin before the initial damage can be repaired. Moreover, in some cases, the protection of one part of the coast leads to the weakening of an adjacent portion, and the sea, foiled in a direct attack, overcomes opposition by a sort of flank movement on an unprotected place. On some coasts the gradual advance of the sea can only be checked for a time; and the erosion of the cliffs during storms is promoted by the disintegrating action of rain and frost, the débris being scattered over the beach and eventually carried away by littoral drift. The rate of encroachment of the sea depends mainly on the exposure of the coast, the slope of the beach and foreshore, and the nature of the cliffs or shore; for on a very open sea-coast exposed to strong winds, with deep water near the shore, the erosive action of the large waves rolling in is very great, especially when breaking against cliffs composed of clay or other readily disintegrated materials. Irresistible secular changes appear to be taking place along some coasts, for a slow but steady advance of the sea may be noted in some places, and a distinct retrogression observed in other parts. The protection of land against the ravages of the sea must depend upon the value of the land and its position. Where villages and towns have been built alongside the sea-coast, large sums may be advantageously expended

in securing such valuable sites from injury, and in forming and preserving promenades in front of them; and where low-lying or reclaimed lands, extending a considerable distance inland, are protected by sea banks, it is very important that these barriers against extensive inundations should be efficiently maintained. In places, however, where long stretches of agricultural land, well above sea-level, bordering the sea-coast are subject to gradual erosion, the cost of adequately protective works would amount to more than the value of the land lost.

The author has for many years taken an interest in the changes taking place along the coasts of England, and the results of the various means adopted at different places for their protection; and his researches into records and observations of littoral drift, the action of waves and tides, sea-coast protection, and shingle-banks and sand beaches have formed the subjects of papers read at the Institution of Civil Engineers and meetings of the British Association, and articles contributed to *The Engineer* and this Journal, which have been collected together to form the present book. The subjects are dealt with under three general heads, namely, (1) "Destruction," (2) "Littoral Drift," and (3) "Protection." After a short introductory chapter, the first head is considered in a single chapter on "The Action of Shore Waves"; the second head forms the title and the subject of the following chapter; whilst the protection of the sea-coast is dealt with in three chapters, two relating to sea-walls and the third to groynes. These matters, however, occupy barely more than one-third of the book, and the remainder of the volume is taken up with an inordinately long chapter of above two hundred pages, giving details of the south, east, and west coasts of England, and a comparatively short chapter on the coasts of northern France, Belgium and Holland. These two last chapters constitute an elaborate compilation of facts concerning the sea-coasts referred to, collected from various publications, including naturally the reports and numerous data obtained by the Coast Erosion Committee of the British Association, and also the author's own observations, which should prove useful for reference; but the main interest is comprised in the earlier portion of the book, which embraces the chief object of its publication.

In the chapter on the action of shore waves, the author propounds his theory that the main agent of the littoral drift observed along our coasts is tidal action, and that storm waves are only auxiliary agents of quite minor importance; and he restates this view with greater emphasis, as an established fact, towards the close of the following chapter, on littoral drift, in these words (p. 75):—

"As already mentioned, the agent which is instrumental in building up shingle into banks and transporting it along the coast is the tide, which accomplishes this by means of the waves which are for ever breaking on the beach as the tide rises and falls. The formation and action of tidal shore wavelets has been already described in the chapter on wave-action. These wavelets, aided by the flood current, lift up and carry forward any coarse sand, loose stones, or other material with which they come in contact, and leave some portion of them stranded at the highest point on the beach to which the tide of the day reaches."

In a paper on "Littoral Drift," read at the Institution

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of Civil Engineers in 1896, Mr. Wheeler enunciated this theory, and in the discussion which followed, remarkable unanimity was manifested by the speakers in dissenting wholly from this view; and it may reasonably be surmised that the author hopes that acceptance of his theory, which was on that occasion denied him by the persons most conversant with the subject, may, when brought forward in the sort of authoritative form of a book, be granted him by the general public. His notion of the power of tidal action is evidently in some measure due to his assumption that the tidal wave is a wave of translation, with the entire body of water composing it in motion throughout its whole depth; and he does not realise that this would involve a continuous movement of the sea in one direction, at the rate of progression of the tidal wave, which in the Pacific Ocean, the cradle of the tides, amounts to about 1000 miles an hour, and even in the English Channel reaches about 55 miles an hour; whilst the clashing together, off the mouth of the Thames, of two of these waves of translation coming from opposite directions would be a remarkable sight. The author, moreover, in attributing littoral drift to the action of the wavelets of the flood tide along the shore, appears to ignore the reverse action of the ebb; though in referring to the effect of tidal currents on submerged sand-beds in channels, he points out that their "movement is one of oscillation and not transportation." A great number of instances might be cited of littoral currents and littoral drift which, in the absence of a tide, could not possibly be attributed to tidal action, as, for example, the littoral movement across the face of the delta of the Mississippi in the almost tideless Gulf of Mexico, the drift which occurs in various places along the shores of the Mediterranean, and the littoral current which diverts towards the south the alluvium issuing from the mouths of the Danube in the Black Sea. The author tries to strengthen his contention as to the paramount effect of the flood tide by ascribing wind waves, the power and influence of which are extended landwards by the increased depth at high water, to tidal action. Thus under the heading of "Tidal Waves" he says:—

"In the great majority of cases the waves which affect beaches, cliffs, and sea-walls are those which occur when the rise of the tide affords the necessary depth of water for their formation. . . . The maximum effect due to the tidal wave is felt at the time of high spring tides, when accompanied by heavy on-shore gales."

Further on also the following passage occurs:—

"Even when the depth of water in front of a sea-wall or cliff is only that due to the rise of tide, water from waves that break is thrown to very great heights. Thus at Hastings, where the beach at the foot of the sea-wall is dry at low water, and the depth of the water is only that due to a rise of 15 feet at high water, during a heavy gale in the winter of 1898 the broken water was thrown as high as the top of a large hotel, as shown in the frontispiece, and shingle was lifted off the beach and carried across the promenade into the bedrooms of the houses fronting the sea. At Peterhead, as already mentioned, the water due to a rise of tide on the fore-shore of only 7 or 8 feet has been known to strike the wall with such force as to be thrown upwards 100 feet."

It is certain that the inhabitants of Hastings will have attributed the striking phenomenon illustrated in the book

to its true cause, the gale, aided undoubtedly by the raised water-level, due partly to the tide, and also partly to the heaping up of the sea against a lee shore by an on-shore gale; whilst the wave-stroke at Peterhead was not due, as implied above, to a tidal rise of 8 feet, but, as mentioned a few pages earlier, to the depth into which the breakwater has been carried, the great exposure of the site, and the large waves, attaining 30 feet in height and 600 feet in length during storms, which, consequently, come against the structure.

Numerous instances have been frankly quoted in the two chapters on wave action and littoral drift of the effect of waves in storms in transporting material along the coast, reference to two of which must suffice:—

"In the Solent, near Hurst Castle, a shingle bank, 2 miles long and 12 feet high, consisting principally of flints resting on a clay base, was moved forward in a north-easterly direction forty yards during a storm in 1824. . . . During a heavy gale stones weighing from 2 to 3 cwt., with large masses of seaweed growing on them, were loosened from their bed at a depth of fifteen fathoms, and thrown on to the beach."

Compared with the forces displayed by these effects, and the others given in the book produced by waves in storms, the wavelets of the flood tide sink into insignificance; and, thanks to the fairness with which these examples have been given, it may be anticipated that an unbiassed, intelligent perusal of these two chapters will lead to conclusions at variance with those of the author, and that it will be realised that waves in storms are the chief forces producing changes in coasts and littoral drift, exercising their maximum effect during high water of spring tides, and when acting in unison with the tidal currents.

From an engineering point of view, the most interesting part of the book is comprised in the three chapters on coast protection by sea-walls and groynes. Sea-walls formed of embankments with pitched slopes, or more or less upright masonry or concrete walls, serve for directly warding off the attacks of the waves in storms from the shore, cliffs, or sea-drives and promenades; whilst groynes of timber, fascines, or concrete are projected at intervals down the beach to arrest the littoral drift, and by thus gradually raising the strand prevent the sea from eroding the shore. Unfortunately groynes, by collecting the drift along one part of the beach, deprive the unprotected portion further leeward of the supply by which its losses by erosion would be naturally replenished; and, consequently, the advance of a length of foreshore produced by groynes is accompanied by a retrogression of the adjacent portion from the cutting off of the drift. A pitched slope is adopted where the shore to be protected is low and sandy, and where materials for a wall are deficient, as along the coasts of Holland and Belgium; and a wall is resorted to where cliffs line the coast, or a sea-drive is constructed considerably above the beach; and this variety in construction is due to differences in the conditions rather than, as suggested by the author to differences of opinion amongst engineers. A simple upright wall has advantages for breakwaters over other forms where the bottom is rocky and the depth moderate; but in contrasting Dover pier, which has not been free from injury, with the breakwaters at Cherbourg, Plymouth,

and Alderney, the author has fallen into a very common error of overlooking the differences of exposure and depth of water at these sites; for Dover is situated in one of the most sheltered places of the English Channel, whereas Cherbourg is much more exposed, and the breakwaters of Plymouth and Alderney are open to the Atlantic, and the latter extends into a depth of 130 feet at low water. Sea-walls, however, differ very materially from breakwaters in being built near high-water mark, and therefore upright sea-walls are subject to considerable erosion at their toe, from the recoil of the waves dashing against them, which affects even chalk and shale, so that unless the foreshore consists of firm rock, the sea-wall, which is usually curved or battered on the face, has to be founded below the limit of erosion, or more commonly is provided with an apron to protect the portion of the beach near the sea-wall from the breaking and recoiling waves. A stepped face is sometimes given to sea-walls, so as to impede the upward run of the waves and break up the recoil; but the work must be solidly built, and only a moderate width given to the steps, otherwise the reduction of the weight on the face blocks due to their projection might lead to their dislocation under the impact of the waves. The author regards a sea-wall curving on its face from the apron laid at the slope of the beach, to the vertical at the top, as the best form, and no doubt such a form leads the waves from a horizontal to a vertical course with the least practicable opposition; but at the same time, by minimising the impediments, it causes the waves to rise higher above the wall, and the upper portion of the water is driven over the promenade by the gale. In the chapter on "Examples of Sea-walls," several sections of sea-walls are given; and both this and the succeeding chapter on "Groynes" contain many interesting details of these works; and the book as a whole furnishes a considerable amount of information about the coasts of England, which must have involved much time and trouble to collect.

EVOLUTION AND ANTI-MATERIALISM.

Principles of Western Civilisation. By Benjamin Kidd. Pp. vi+518. (London: Macmillan and Co, Ltd., 1902.) Price 15s. net.

TO those who, some years back, read Mr. Benjamin Kidd's "Social Evolution" with great interest and learnt much from it, his new book will be a profound disappointment. Undertaking to settle all the great questions with which our civilisation is confronted, it leaves many important facts out of sight and fails to find a remedy for the main evils. The style is ponderous and difficult. In some parts very careful reading is required if the exact meaning is to be made out.

The line of argument followed is this. Evolution has upset all our old philosophies and obliged us to remodel our way of thinking. Since Darwin's time, evolution has undergone a great development in the hands of Weismann. We now see that the future is predominant over the present. The overwhelming proportion of individuals interested in the struggle for existence are yet unborn. The contending races are struggling for "an advantage, probably always far in the future, to which the individual